What is claimed is :

1. A method of forming a Group III-V compound semiconductor layer, comprising the step of :

carrying out an epitaxial growth of a Group III-V compound semiconductor layer over a base material having a crystal structure by use of a mask,

wherein said mask satisfies the equation (1) :

$$h \geqq (w/2) \tan \theta \quad \text{------ (1)}$$

where " θ " is a base angle of a facet structure of said Group III-V compound semiconductor layer on said epitaxial growth ; "h" is a thickness of said mask ; and "w" is an opening width of said mask at its lower level, and said opening width is defined in a direction included in a plane which is vertical to both said surface of said base material and said side face of said facet structure.

2. The method as claimed in claim 1, wherein said Group III-V compound semiconductor layer comprises a nitride semiconductor including a Group III element.

3. The method as claimed in claim 1, wherein said base material has the same type of crystal structure as said Group III-V compound semiconductor layer.

4. The method as claimed in claim 1, wherein said opening of said mask has a stripe-shape with a longitudinal direction in the range of –10 degrees to +10 degrees from [1 –1 0 0] of said base material.

5. The method as claimed in claim 1, wherein said opening of said mask has a stripe-shape with a longitudinal direction in the range of –10 degrees to +10 degrees from [1 1 –2 0] of said base material.

6. The method as claimed in claim 1, wherein said Group III-V compound semiconductor layer is grown by a vapor phase epitaxy.

7. The method as claimed in claim 1, wherein said Group III-V compound semiconductor layer is grown until a thickness of said Group III-V compound semiconductor layer becomes thicker than said thickness "h" of said mask, so that said mask is completely buried within said Group III-V compound semiconductor layer.

8. The method as claimed in claim 1, further comprising the steps of :

forming said base material of a layered shape with a substantially flat surface over a substrate ; and

forming said mask on said substantially flat surface, prior to said epitaxial growth.

9. The method as claimed in claim 8, wherein said base angle of said facet structure is defined to be an included angle between a facet face of said facet structure and said substantially flat surface of said base material.

10. The method as claimed in claim 8, wherein said step of forming said mask further comprises the steps of :

forming a mask material layer on said substantially flat surface of said base material ; and

selectively removing said mask material layer to form said mask.

11. The method as claimed in claim 8, wherein said step of forming said mask further comprises the steps of :

forming a first mask material layer on said substantially flat surface of said base material ;

forming a second mask material layer on said first mask material layer ;

selectively forming a resist mask on said second mask material layer ;

selectively removing said second mask material layer by use of said resist mask ;

removing said resist mask ; and

selectively removing said first mask material layer by use of said second mask material layer as a mask, to form said mask which comprises

a combination of said first and second mask material layers.

12. The method as claimed in claim 1, further comprising the steps of :

forming said mask over a substrate ; and

selectively forming said base material of a layered shape over said substrate and in said opening of said mask, prior to said epitaxial growth.

13. The method as claimed in claim 13, wherein said base angle of said facet structure is defined to be an included angle between a facet face and a base side of said facet structure.

14. The method as claimed in claim 1, further comprising the steps of :

forming said base material of a layered shape with a substantially flat surface over a substrate ;

forming said mask on said substantially flat surface ; and

selectively removing said base material to form a base layer pattern with side walls under said mask, prior to said epitaxial growth from said side walls of said base layer pattern, so that said facet structure is formed in said opening of said mask during said epitaxial growth.

15. The method as claimed in claim 13, wherein said base angle of

said facet structure is defined to be an included angle between a facet face and a base side of said facet structure.

16. The method as claimed in claim 1, further comprising the step of : removing said base material after said epitaxial growth is completed.

17. The method as claimed in claim 1, wherein said thickness "h" of said mask is larger than a half of said opening width "w" thereof.

18. A Group III-V compound semiconductor epitaxial layer having an upper region which has a crystal structure with a tilt angle of at most 100 seconds.

19. The Group III-V compound semiconductor epitaxial layer as claimed in claim 18, wherein said crystal structure of said upper region has a twist angle of at most 50 seconds.

20. The Group III-V compound semiconductor epitaxial layer as claimed in claim 18, wherein said Group III-V compound semiconductor epitaxial layer comprises a nitride semiconductor including a Group III element .

21. A Group III-V compound semiconductor epitaxial layer having an upper region which has a crystal structure with a twist angle of at most

50 seconds.

22. The Group III-V compound semiconductor epitaxial layer as claimed in claim 21, wherein said crystal structure of said upper region has a tilt angle of at most 100 seconds.

23. The Group III-V compound semiconductor epitaxial layer as claimed in claim 21, wherein said Group III-V compound semiconductor epitaxial layer comprises a nitride semiconductor including a Group III element.

24. A semiconductor layered structure comprising :

a base material having a crystal structure ;

a mask over said base material, and said mask having at least one opening defined by side walls, and said at least one opening further defining at least a growth area of a surface of said base material ; and

a Group III-V compound semiconductor epitaxial layer being directly on said at least growth area and said Group III-V compound semiconductor epitaxial layer completely burying said mask,

wherein said Group III-V compound semiconductor epitaxial layer includes dislocations which extend substantially parallel to a thickness direction of said Group III-V compound semiconductor epitaxial layer, and at a facet face of a facet structure of said Group III-V compound semiconductor epitaxial layer, said dislocations turn substantially

perpendicular to said thickness direction and are terminated by said side walls of said mask.

25. The semiconductor layered structure as claimed in claim 24, wherein said mask satisfies the equation (1) :

$$h \geqq (w/2) \tan \theta \qquad \text{------ (1)}$$

where " θ " is a base angle of said facet structure ; "h" is a thickness of said mask ; and "w" is an opening width of said mask at its lower level, and said opening width is defined in a direction included in a plane which is vertical to both said surface of said base material and a side face of said facet structure.

26. The semiconductor layered structure as claimed in claim 24, wherein said Group III-V compound semiconductor layer comprises a nitride semiconductor including a Group III element.

27. The semiconductor layered structure as claimed in claim 24, wherein said base material has the same type of crystal structure as said Group III-V compound semiconductor layer.

28. The semiconductor layered structure as claimed in claim 24, wherein said opening of said mask has a stripe-shape with a longitudinal direction in the range of –10 degrees to +10 degrees from [1 –1 0 0] of said base material.

29. The semiconductor layered structure as claimed in claim 24, wherein said opening of said mask has a stripe-shape with a longitudinal direction in the range of –10 degrees to +10 degrees from [1 1 –2 0] of said base material.

30. The semiconductor layered structure as claimed in claim 24, wherein said thickness "h" of said mask is larger than a half of said opening width "w" thereof.

31. A semiconductor layered structure comprising :

a base material having a crystal structure ;

a mask over said base material, and said mask having at least one opening defined by side walls, and said at least one opening further defining at least a growth area of a surface of said base material ; and

a Group III-V compound semiconductor epitaxial layer being directly on said at least growth area and said Group III-V compound semiconductor epitaxial layer completely burying said mask,

wherein said mask satisfies the equation (1) :

$$h \geqq (w/2) \tan \theta \qquad \text{------ (1)}$$

where " θ " is a base angle of a facet structure of said Group III-V compound semiconductor layer on said epitaxial growth ; "h" is a thickness of said mask ; and "w" is an opening width of said mask at its lower level, and said opening width is defined in a direction included in a plane which

is vertical to both said surface of said base material and a side face of said facet structure.

32. The semiconductor layered structure as claimed in claim 31, wherein said Group III-V compound semiconductor epitaxial layer includes dislocations which extend substantially parallel to a thickness direction of said Group III-V compound semiconductor epitaxial layer, and at a facet face of said facet structure, said dislocations turn substantially perpendicular to said thickness direction and are terminated by said side walls of said mask.

33. The semiconductor layered structure as claimed in claim 31, wherein said Group III-V compound semiconductor layer comprises a nitride semiconductor including a Group III element.

34. The semiconductor layered structure as claimed in claim 31, wherein said base material has the same type of crystal structure as said Group III-V compound semiconductor layer.

35. The semiconductor layered structure as claimed in claim 31, wherein said opening of said mask has a stripe-shape with a longitudinal direction in the range of –10 degrees to +10 degrees from [1 –1 0 0] of said base material.

36. The semiconductor layered structure as claimed in claim 31, wherein said opening of said mask has a stripe-shape with a longitudinal direction in the range of –10 degrees to +10 degrees from [1 1 –2 0] of said base material.

37. The semiconductor layered structure as claimed in claim 31, wherein said thickness "h" of said mask is larger than a half of said opening width "w" thereof.

38. A substrate structure comprising :

a substrate ;

a base layer having a crystal structure over said substrate ;

a mask over said base layer, and said mask having at least one opening defined by side walls, and said at least one opening further defining at least a growth area of a surface of said base layer ; and

a Group III-V compound semiconductor epitaxial layer being directly on said at least growth area and said Group III-V compound semiconductor epitaxial layer completely burying said mask,

wherein said Group III-V compound semiconductor epitaxial layer includes dislocations which extend substantially parallel to a thickness direction of said Group III-V compound semiconductor epitaxial layer, and at a facet face of a facet structure of said Group III-V compound semiconductor epitaxial layer, said dislocations turn substantially perpendicular to said thickness direction and are terminated by said side

walls of said mask.

39. The substrate structure as claimed in claim 38, wherein said mask satisfies the equation (1) :

$$h \geqq (w/2) \tan \theta \qquad \text{------ (1)}$$

where " θ " is a base angle of said facet structure ; "h" is a thickness of said mask ; and "w" is an opening width of said mask at its lower level, and said opening width is defined in a direction included in a plane which is vertical to both said surface of said base layer and a side face of said facet structure.

40. The substrate structure as claimed in claim 38, wherein said Group III-V compound semiconductor layer comprises a nitride semiconductor including a Group III element.

41. The substrate structure as claimed in claim 38, wherein said base layer has the same type of crystal structure as said Group III-V compound semiconductor layer.

42. The substrate structure as claimed in claim 38, wherein said opening of said mask has a stripe-shape with a longitudinal direction in the range of –10 degrees to +10 degrees from [1 –1 0 0] of said base layer.

43. The substrate structure as claimed in claim 38, wherein said opening of said mask has a stripe-shape with a longitudinal direction in the

range of –10 degrees to +10 degrees from [1 1 –2 0] of said base layer.

44. The substrate structure as claimed in claim 38, wherein said thickness "h" of said mask is larger than a half of said opening width "w" thereof.

45. A substrate structure comprising :

a substrate ;

a base layer having a crystal structure over said substrate ;

a mask over said base layer, and said mask having at least one opening defined by side walls, and said at least one opening further defining at least a growth area of a surface of said base layer ; and

a Group III-V compound semiconductor epitaxial layer being directly on said at least growth area and said Group III-V compound semiconductor epitaxial layer completely burying said mask,

wherein said mask satisfies the equation (1) :

$$h \geqq (w/2) \tan \theta \qquad \text{------ (1)}$$

where " θ " is a base angle of a facet structure of said Group III-V compound semiconductor layer on said epitaxial growth ; "h" is a thickness of said mask ; and "w" is an opening width of said mask at its lower level, and said opening width is defined in a direction included in a plane which is vertical to both said surface of said base layer and a side face of said facet structure.

46. The substrate structure as claimed in claim 45, wherein said Group III-V compound semiconductor epitaxial layer includes dislocations which extend substantially parallel to a thickness direction of said Group III-V compound semiconductor epitaxial layer, and at a facet face of said facet structure, said dislocations turn substantially perpendicular to said thickness direction and are terminated by said side walls of said mask.

47. The substrate structure as claimed in claim 45, wherein said Group III-V compound semiconductor layer comprises a nitride semiconductor including a Group III element.

48. The substrate structure as claimed in claim 45, wherein said base layer has the same type of crystal structure as said Group III-V compound semiconductor layer.

49. The substrate structure as claimed in claim 45, wherein said opening of said mask has a stripe-shape with a longitudinal direction in the range of –10 degrees to +10 degrees from [1 –1 0 0] of said base layer.

50. The substrate structure as claimed in claim 45, wherein said opening of said mask has a stripe-shape with a longitudinal direction in the range of –10 degrees to +10 degrees from [1 1 –2 0] of said base layer.

51. The substrate structure as claimed in claim 45, wherein said

thickness "h" of said mask is larger than a half of said opening width "w" thereof.

52. A semiconductor device including at least a Group III-V compound semiconductor epitaxial layer which includes an upper region having a crystal structure with a tilt angle of at most 100 seconds.

53. The semiconductor device as claimed in claim 52, wherein said crystal structure of said upper region has a twist angle of at most 50 seconds.

54. The semiconductor device as claimed in claim 52, wherein said Group III-V compound semiconductor epitaxial layer comprises a nitride semiconductor including a Group III element .

55. A semiconductor device including at least a Group III-V compound semiconductor epitaxial layer which includes an upper region having a crystal structure with a twist angle of at most 50 seconds.

56. The semiconductor device as claimed in claim 55, wherein said crystal structure of said upper region has a tilt angle of at most 100 seconds.

57. The semiconductor device as claimed in claim 55, wherein said

Group III-V compound semiconductor epitaxial layer comprises a nitride semiconductor including a Group III element.